NEWS REPORT

NATIONAL ACADEMY OF SCIENCES
NATIONAL RESEARCH COUNCIL

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NEWS REPORT

National Academy of Sciences National Research Council

VOLUME VI *May–June 1956* NUMBER 3

The Directory of Industrial Research Laboratories of the United States

CHARLES I. CAMPBELL

Assistant to the Executive Officer
National Academy of Sciences–National Research Council

ONE of the first activities of the newly organized National Research Council of the National Academy of Sciences as it turned from problems of war to the opportunities of peace in 1918 was a survey of the industrial research laboratories of the United States. The result was Bulletin No. 2 of the National Research Council "Industrial Research Laboratories of the United States" published in March 1920, listing and briefly describing the research laboratories of 297 companies. This spring, 36 years later, the 10th edition of that directory was published, including information on laboratories of 4,060 companies; among them were over 150 of those listed in the original survey. The intervening years have been a truly explosive expansion of the research expenditures of American industry from perhaps $20 million to $1 billion in 1955. Organizations carrying on industrial research have increased in number, possibly more than the factor of 15 or so one would deduce from simply comparing the number of companies included in the two editions of the book. At the same time the companies themselves have expanded their research operations. In the first edition, for example, the General Motors Company listed a single laboratory with a staff of 22 technical employees; in 1955, 34 laboratories were listed, employing 6,000 professional and technical personnel and nearly 5,000 others.

We, of course, have no satisfactory way of knowing what fraction of the laboratories that might have been included have actually been reached with questionnaires, but we feel confident that most of the large industrial research laboratories have been reported. For the current edition a special effort was made to reach as many as possible with the limited staff available. This seemed particularly desirable in view of the great expansion that has taken place in industrial research since 1949 when material for the previous edition was collected. Over 21,000 questionnaires were mailed to companies that were considered to have research activities. The response was gratifying: forty-six percent of the questionnaires were answered, which is considered to be a remarkable reply. This is substantially better than the response to most of the previous inquiries, in spite of the fact that three times more questionnaires were sent out than ever before.

It may be of interest to know how a list of 21,000 companies likely to be engaged in industrial research is compiled. The point of departure of course is always the previous edition. Over 150 laboratories that appeared in the first edition are still identifiable in the current edition, and over 2,500 of the 3,000 laboratories of the ninth edition are listed in the current edition. The Bureau of Labor Statistics very kindly made available a list of 1,600 firms who had been consulted in a research survey carried out in conjunction with the Department of Defense since the previous edition of the directory. Announcements were placed in a number of professional and technical journals inviting requests for questionnaires. The rest of the list was compiled with great labor by screening recent issues of the technical journals and selected industrial registers.

There are at least three reasons for large response to our questionnaire. The first is the high regard which the Academy–Research Council enjoys in industrial science throughout the country. The second is the great value attached to the laboratory directory itself by business, government, and science. One of the pleasures of working with the directory has been the enthusiasm and cooperation which has been given both by the firms providing the information and those who make use of the book. Many telephone inquiries and letters were received from firms preparing replies expressing their appreciation for the directory and the opportunity to be listed in it. One of the larger companies sent a member of their staff to work with us to assure that their response was appropriate. The third reason for good response is that the questionnaire is brief and consistently has been held to simplicity in the interest of maximum response.

Consideration was given in planning this edition to whether more information or perhaps different information should be sought. A number of distinguished industrial scientists were consulted in the matter and from their replies it was concluded that there was little additional information that could be obtained without peril to good response. It was recommended, however, that a simple code be designed to indicate something about the ownership or sponsorship of the laboratory and something about the kind of services it offers. Thus the directory now indicates whether a laboratory is owned by a parent company, is separately incorporated or, is operated by a trade association or by a non-profit foundation. The directory also indicates whether the laboratory does research only for its own organization, research for a fee, offers consultation or advice, and finally whether it may offer testing and analytical services.

With this exception the information provided about the laboratories is the same as it has been in earlier editions. Principal officers and research executives of the companies are listed, as well as the name and location of the laboratories, the fields of research covered, and the number of professional, technical, and supporting personnel.

With ten editions of the directory now in hand spanning 36 of the most dynamic years of industrial research it is tempting to draw quantitative conclusions about the growth of research from an analysis of the information they contain. But we have restrained ourselves from taking very seriously any quantitative comparisons, at least of the overall figures on laboratories and personnel. Too much depends upon the varying emphasis which has been placed from edition to edition on preparing mailing lists, differences in the interpretation of the terms "industrial research," and "laboratory." The compilers of the directory have had to answer such questions as these: Does a lone chemist who owns his own laboratory but who is not regularly employed by a manufacturing company qualify to be listed? We have generally concluded that he does on the argument that a single specialist may provide a needed service in a specific location that might otherwise not be known if he were excluded. Should manufacturing pharmaceutical companies whose names include the term "laboratories" but whose laboratories carry on only quality control analysis without engaging in research be included in the book? We have believed that they should not, and testing laboratories that do not carry on research into

improved testing methods, etc., in addition to routine testing and analysis were not included either. Companies that indicated that they occasionally assemble ad hoc teams of specialists to carry on research or development for brief periods were excluded on the grounds that while they may be doing research, such teams do not thus constitute a research laboratory. On the other hand permanently organized staffs engaged in engineering development rather than research narrowly defined were classed as comprising a research laboratory and were included in the survey.

In spite of variations among editions there are useful comparisons that can be made, and a carefully designed study of the several editions might yield valuable material regarding the organization of industrial research. Consideration is being given to the feasibility of carrying on such a study during the coming year. For example more than 2,500 laboratories are listed in both the 1950 and 1956 editions of the book, and probably at least 2,000 of these also appeared in the first postwar edition in 1946. The growth of these laboratories, increases and trends in diversification of research, and perhaps the proliferation of their interlaboratory organization could be studied. This latter point was a striking feature of laboratories in some fields. One of the large instrument companies, for example, added three subsidiary companies to its organization during the compilation, each of which carried on research. A gross comparison of the number of laboratories per organization reported in the two editions shows an increase from 1.6 laboratories per company in 1950 to 1.9 in 1955. Part of this apparent increase may be merely a reflection of our special efforts in the 1955 edition to report under one entry the full research and development organization of corporations having many subsidiaries, but a part of the increase must certainly be significant.

Comparisons of certain data reported by companies appearing in several editions could provide a fascinating picture of the pattern of growth of industrial research in this country.

Analysis of the data in the previous edition was made in terms of numbers of personnel of various specialities in different fields of industrial research, distribution of laboratories by size, and state, metropolitan areas, and so on. This was published in *Chemical and Engineering News,* Vol. 29, No. 36, p. 3604, 1951. Similar analyses will no doubt be made based on the present volume.

This is but one of many uses to which the directory may be put. It serves as a valuable tool for industrial management in securing specialized research services, as an aid to professional personnel seeking employment in specific kinds of research activities in specific areas, as a means for directing inquiries and information to a selected group of laboratories, and as a general reference source of information regarding the mode of organization of research laboratories. Already expressions of gratitude have been received from those who use the book, justifying our belief that the traditional compilation of the "Directory of Industrial Research Laboratories of the United States" is a unique and significant service to industrial science in America.

SCIENCE NEWS

ANNUAL MEETING NATIONAL ACADEMY OF SCIENCES

The ninety-third annual meeting of the National Academy of Sciences was held in Washington, April 23–25, with over two hundred and thirty members in attendance. The eight scientific sessions held on Monday, April 23, and Wednesday, April 25, included 26 contributed papers and three symposia of invited papers described below. The business session of the Academy was held on Tuesday, April 24.

Dr. Alexander von Muralt, Rector of the University of Bern and President of the National Research Council of Switzerland, was the Academy's guest-of-honor and addressed the members and their guests at the Academy dinner on Tuesday evening. John E. Burchard, President of the American Academy of Arts and Sciences and Dean of Humanities and Social Studies at the Massachusetts Institute of Technology, was also an honored guest and briefly addressed the dinner audience. Professor Gaston Dupouy, Director of the Centre National de la Recherche Scientifique in Paris, was also present as a guest of the Academy.

The scientific sessions on Monday, April 23, were devoted to contributed papers and to a geophysics symposium, "Solar and Terrestrial Relationships." Ernest H. Vestine of the Carnegie Institution of Washington was chairman of the morning session of the symposium, which was devoted to solar phenomena. The afternoon session, under the chairmanship of Ross Gunn of the U. S. Weather Bureau, was centered primarily on terrestrial phenomena.

On Wednesday, April 25, there were further sessions of contributed papers and two more symposia of invited papers. In the first, "Biomolecular Organization and Life Processes," under the chairmanship of Francis O. Schmitt of Massachusetts Institute of Technology, five speakers covered the various aspects of the field. The formal presentations were followed by a period of general discussion. The second symposium, "Science in Education," featured discussion of this critically important problem by Arthur S. Adams, President of the American Council on Education; George W. Corner, Historian of the Rockefeller Institute; Clarence Faust, President of the Fund for the Advancement of Education; Joel Hildebrand, emeritus Professor of Chemistry at the University of California, and Henry Allen Moe, Secretary General of the Guggenheim Foundation. President Bronk served as Chairman of the symposium.

Seven Academy medals and awards were presented in an evening ceremony, Monday, April 23. Each of the recipients responded with a brief address on significant phases of their scientific work. Alfred Clarence Redfield received the Alexander Agassiz Medal in recognition of his distinguished contributions to oceanography. The Henry Draper Medal was awarded to Professor Hendrick C. van de Hulst of Leiden for his pioneer work on the 21-cm radiation of neutral hydrogen, which has opened up a new field of galactic research. The Minister of The Netherlands, Baron S. G. M. van Voorst tot Voorst, accepted the medal on behalf of Dr. van de Hulst.

Archie Fairly Carr received the Daniel Giraud Elliot Medal in recognition of his volume entitled "Handbook of Turtles: The Turtles of the United States, Canada, and Baja California" (1952). The Kimber Genetics Award for distinguished achievement in the broad field of genetics was presented to Sewall Green Wright. The Jessie Stevenson Kovalenko Medal was awarded to Peyton F. Rous in honor of his distinguished contributions to the field of experimental medicine. Alfred S. Romer received the Mary Clark Thompson Medal which is awarded for distinguished service to geology or paleontology. The James Craig Watson Medal was awarded to Chester B. Watts of the U. S. Naval Observatory in recognition of his outstanding contributions to astronomical research.

A reception followed the medal presentations at the Academy–Research Council building. During the reception, scientific demonstrations and exhibits were on view in the library and reading room.

Elections of officers and new members during the business session of the Academy on Tuesday morning, April 24, are reported elsewhere in this issue.

The business session on Tuesday afternoon was devoted to reports and discussions relating to the Academy's many activities and to a number of broad questions of general concern to science and scientists. Afterwards the members met with officers of the Divisions of the Research Council to discuss matters of common interest.

While the members met in business session, the lady guests of the Academy enjoyed a tour to Bellevue and Le Baron Farm, two of the historic homes open to the public during Garden Week in Virginia.

ELECTION OF OFFICERS AND MEMBERS NATIONAL ACADEMY OF SCIENCES

At the annual business meeting of the Academy on April 24, William J. Robbins, Director of the New York Botanical Garden, was reelected Treasurer for a four-year term, beginning July 1, 1956. Dr. Robbins has served as Treasurer of the Academy since July 1, 1948. I. I. Rabi, Professor of Physics at Columbia University, and F. E. Terman, Dean of the School of Engineering at Stanford University, were elected members of the Council of the Academy and will each serve a three-year term. Dr. Rabi and Dr. Terman will replace James Gilluly, United States Geological Survey, and Edwin B. Wilson, Harvard School of Public Health, who will complete their terms on the Council on June 30, 1956.

The following members and foreign associates were elected to the Academy:

New Members of the Academy

GEORG VON BÉKÉSY, Senior Research Fellow in Psychophysics, Harvard University.

MANSON BENEDICT, Professor of Nuclear Engineering, Massachusetts Institute of Technology.

KONRAD EMIL BLOCH, Professor of Chemistry, Harvard University.

KENNETH STEWART COLE, Director, Laboratory of Biophysics, National Institute of Neurology, Diseases, and Blindness, National Institutes of Health.

BRYCE LOW CRAWFORD, JR., Professor of Physical Chemistry, University of Minnesota.

WILLIAM ALFRED FOWLER, Professor of Physics, California Institute of Technology.

CARYL PARKER HASKINS, President, Carnegie Institution of Washington.

EMIL WALTER HAURY, Professor of Anthropology, University of Arizona.

POLYKARP KUSCH, Professor of Physics, Columbia University.

ALBERT LESTER LEHNINGER, Professor of Physiological Chemistry, School of Medicine, Johns Hopkins University.

MARIA GOEPPERT MAYER, Senior Physicist, Argonne National Laboratory.

CHARLES PHILLIP MILLER, Professor of Medicine, University of Chicago.

WILLIAM WILSON MORGAN, Professor of Astronomy, Yerkes Observatory, University of Chicago.

WALTER HEINRICH MUNK, Professor of Geophysics, Scripps Institution of Oceanography.

MELVIN SPENCER NEWMAN, Professor of Chemistry, Ohio State University.

ROBERT FRANKLIN PITTS, Professor of Physiology, Cornell University College of Medicine.

JOHN D. ROBERTS, Professor of Organic Chemistry, California Institute of Technology.

KARL PATTERSON SCHMIDT, Emeritus Curator, Department of Zoology, Chicago Natural History Museum.

MARTIN SCHWARZSCHILD, Professor of Astronomy, Princeton University.

CLAUDE ELWOOD SHANNON, Research Mathematician, Bell Telephone Laboratories, Inc.

FOLKE KARL SKOOG, Professor of Botany, University of Wisconsin.

NORMAN EARL STEENROD, Professor of Mathematics, Princeton University.

WALTER HUGO STOCKMAYER, Professor of Physical Chemistry, Massachusetts Institute of Technology.

ALBERT SZENT-GYÖRGYI, Director of Research, Institute for Muscle Research, Inc., Marine Biological Laboratory.

CHARLES HARD TOWNES, Professor of Physics, Columbia University.

FRANCIS JOHN TURNER, Professor of Geology, University of California.

JOHN VERHOOGEN, Professor of Geology, University of California.

MAURICE BOLKS VISSCHER, Professor of Physiology, University of Minnesota.

JOHN CHRISTIAN WARNER, President, Carnegie Institute of Technology.

WALTER HENRY ZINN, Director, Argonne National Laboratory.

Foreign Associates

FREDERICK GUGENHEIM GREGORY, Director, Research Institute of Plant Physiology, Imperial College of Science and Technology, England.

SIR KARIAMANIKKAM KRISHNAN, Director, National Physical Laboratory, India.

BARON ALBERT MICHOTTE VAN DER BERCK (ALBERT EDOUARD MICHOTTE), Professor of Psychology, University of Louvain, Belgium.

JOSEPH JEAN CAMILLE PÉRÈS, Dean, Faculty of Sciences, University of Paris, France.

FIRE RESEARCH CONFERENCE

The Committee on Fire Research, recently organized within the Division of Engineering and Industrial Research, has established a 34-member Fire Research Conference to more effectively carry out its responsibilities in this area.

The Fire Research Conference with its larger membership is more fully representative of the many and varied interests concerned with the prevention and control of fires. It is believed that the Conference can be effective in providing channels of communication between research workers and those whose responsibilities and interests are principally in the early application of new techniques to the prevention and control of fires. The Conference will

collaborate and advise the Committee on the stimulation and correlation of fire research. The responsibility for direct research advisory service to the Federal Civil Defense Administration, however, will remain with the Committee, whose members are predominantly interested in research.

The membership of the Conference includes the eight members of the Committee on Fire Research. H. C. Hottel, Massachusetts Institute of Technology, is serving as Chairman of both groups and Lt. Comdr. D. W. Thornhill, U. S. Navy, ret., will serve as Executive Secretary.

INTERNATIONAL GEOPHYSICAL YEAR ARCTIC CONFERENCE

Delegates from 12 countries met at the Royal Institute of Technology in Stockholm, May 22–25, to coordinate planning for the Arctic program of the International Geophysical Year (IGY). Also present were Sydney Chapman and Marcel Nicolet, President and Secretary-General respectively of the Special Committee of the IGY (CSAGI), and J. van Mieghem, representative of the World Meteorological Organization. Arrangements for the conference were made by N. Herlofson, Arctic Adjoint Secretary for CSAGI.

The countries represented at the conference were Canada, Denmark, Finland, France, Germany, Great Britain, Iceland, Norway, Poland, Sweden, USSR, and the United States. The United States delegation was composed as follows:

John C. Reed, U. S. Geological Survey, *Chairman*
Hugh Odishaw, Executive Secretary, USA National Committee, IGY, *Secretary*
Wallace W. Atwood, Jr., National Academy of Sciences
N. T. Bobrovnikoff, Ohio State University
A. P. Crary, USA National Committee, IGY
E. G. Droessler, Office of Assistant Secretary of Defense, Research and Development
C. T. Elvey, University of Alaska
J. O. Fletcher, Maxwell Air Force Base
N. C. Gerson, Massachusetts Institute of Technology
J. W. Joyce, National Science Foundation
H. E. Newell, Jr., Naval Research Laboratory
R. R. Philippe, U. S. Office of Chief of Engineers
Louis O. Quam, Office of Naval Research
Alan H. Shapley, Vice Chairman, USA National Committee, IGY
Harry Wexler, U. S. Weather Bureau
W. A. Wood, Arctic Institute of North America

BIOLOGICAL EFFECTS OF ATOMIC RADIATION

The first reports of a study of the biological effects of atomic radiation were made public by the National Academy of Sciences at a press conference on June 12. The conclusions of the six committees studying the problem indicated in general that the peacetime development of atomic energy and nuclear weapons can proceed without endangering mankind provided adequate precautions are taken. However, in order that these precautions may be adequate as development proceeds intensive research on a number of aspects of the biological effects of atomic radiation was recommended.

The six study committees with their chairmen, numbering in total membership more than one hundred scientists, are as follows: *Genetics*, Warren Weaver, Vice President for the Natural and Medical Sciences of the Rockefeller Foundation; *Pathology*, Shields Warren, Director of the New England Deaconess Hospital; *Agriculture and Food Supplies*, A. Geoffrey Norman, Department of Botany, University of Michigan; *Oceanography and Fisheries*, Roger Revelle, Director of the Scripps Institution of Oceanography; *Meteorology*, Harry Wexler, Director of Meteorological Research, U. S. Weather Bureau; and *Disposal and Dispersal of Radioactive Wastes*, Abel Wolman, Johns Hopkins University.

The genetics committee recommended that a national system of radiation-exposure record-keeping be instituted for every individual to keep track of his total exposure during his life to X-rays, to natural radioactivity, to fall-out from weapons testing, and to all other gamma radiation. They recommended that for the present the members of the population should not receive more than an average of 10 roentgens above natural background as a total accumulated dose to their reproductive cells from conception to the age of 30.

An exposure of a total of 50 roentgens in the same period for the relatively small numbers of individuals receiving occupational radiations was suggested as reasonable, and an additional 50 roentgens up to the age of 40 was considered reasonable, by which time nine-tenths of the children of these workers would have been born.

In general the committee urged that radiation to the reproductive cells be kept as low as possible and suggested that every effort be made to assign tasks involving higher radiation exposures to individuals who, for age or other reasons, are unlikely thereafter to have additional offspring.

In regard to radiation from weapons testing the committee stated:

> We fortunately do not need to worry greatly about what we have received or are now receiving * * * of the upper limit of 10 roentgens suggested * * * we are at present spending less—probably under 1 roentgen—for weapons testing. We may find it desirable or even almost obligatory that we spend a fair amount on atomic power plants. But we must watch and guard all our expenditures. From the point of view of genetics, they are all bad.

The committee on pathologic effects noted that there would probably be no demonstrable somatic effects on individuals whose radiation levels were held to those recommended by the geneticists for the whole population. They noted, however, that there is evidence that higher doses to the whole body may result in a shortening of the life span due to non-specific causes, and it may be that a proportional effect may occur at very low levels, though this would be extremely difficult to observe.

International cooperation in study and control of pollution of the seas and the atmosphere were urged by the committees on oceanography and meteorology. Both groups recommended that intensive studies be undertaken of the distribution of radioactivity and noted that the use of radioisotope tracers for atmospheric and oceanographic studies offered powerful tools for research, but as the background radioactivity increases these tools will become useless, perhaps within the next 10 to 20 years.

The committee on disposal and dispersal of radioactive wastes noted that the quantities of radioactivity resulting from peacetime activities might exceed that produced in an atomic warfare and urged continued vigorous research on means for safe operation of nuclear reactors and processing plants and on safe means for controlling radioactive wastes.

The committee on agriculture and food supplies considered the constructive effects of atomic radiations and though they anticipate no drastic imminent improvement in agricultural production as a result of the use of radiation, they were optimistic about the research potential of radiation techniques both in agriculture and food processing. The committee was not alarmed by the foreseeable contamination of food supplies from peacetime development of atomic energy, but emphasized that catastrophic effects on agricultural production might result from atomic warfare. They also noted that knowledge of the food chains by which radioactivity in the soil and plants reaches humans is not adequate to permit confident estimates of the maximum permissible levels of various radioisotopes in the food chain.

A summary of the reports has been prepared for lay readers and is available in quantity on request at the Academy-Research Council Publications Office. The committee reports themselves have been published without their technical appendices and are also available on request.

NEW EXECUTIVE ORDER ON NATIONAL RESEARCH COUNCIL

On May 10, the President of the United States issued Executive Order No. 10668 restating the functions of the National Research Council and changing the method of designation of representatives of Government agencies who serve as members of the Council.

The National Research Council was organized by the National Academy of Sciences during World War I. In recognition of the work accomplished by the Council, President Wilson requested the Academy to perpetuate it under Executive Order No. 2859 of May 11, 1918. Since that time the Council has continued as a part of the Academy organization and included a number of Government representatives.

In view of the great expansion of all types of scientific research and the need for continued close cooperation of governmental and non-governmental agencies, it is particularly fitting that the functions of the Council be outlined anew. No substantive changes in functions have been made, although several references in the original Executive Order have been brought up to date in the new one.

The text of the new order follows:

WHEREAS the National Research Council (hereinafter referred to as the Council) was organized in 1916 at the request of the President by the National Academy of Sciences, under its congressional charter, as a measure of national preparedness; and

WHEREAS in recognition of the work accomplished by the National Academy of Sciences through the Council in organizing research, in furthering science, and in securing cooperation of government and non-government agencies in the solution of their problems, the Council has been perpetuated by the Academy as requested by the President in Executive Order No. 2859 of May 11, 1918; and

WHEREAS the effective prosecution of the Council's work requires the close cooperation of the scientific and technical branches of the Government, both military and civil, and makes representation of the Government on the Council desirable:

NOW, THEREFORE, by virtue of the authority vested in me as President of the United States, it is ordered as follows:

1. The functions of the Council shall be as follows:

(a) In general, to stimulate research in the mathematical, physical, and biological sciences, and in the application of these sciences to engineering, agriculture, medicine, and other useful arts, with the object of increasing knowledge, of strengthening the national defense, and of contributing in other ways to the public welfare.

(b) To survey the broad possibilities of science, to formulate comprehensive projects of research, and to develop effective means of utilizing the scientific and technical resources of the country for dealing with such projects.

(c) To promote cooperation in research, at home and abroad, in order to secure concentration of effort, minimize duplication, and stimulate progress; but in all cooperative undertakings to give encouragement to individual initiative, as fundamentally important to the advancement of science.

(d) To serve as a means of bringing American and foreign investigators into active cooperation with the scientific and technical services of the Department of Defense and of the civil branches of the Government.

(e) To direct the attention of scientific and technical investigators to the importance of military and industrial problems in connection with national defense, and to aid in the solution of these problems by organizing specific researches.

(f) To gather and collate scientific and technical information, at home and abroad, in cooperation with governmental and other agencies, and to render such information available to duly accredited persons.

2. The Government shall be represented on the Council by members who are officers or employees of specified departments and agencies of the executive branch of the Government. The National Academy of Sciences shall specify, from time to time, the departments and agencies from which Government members shall be designated, and shall determine, from time to time, the number of Government members who shall be designated from each such department and agency. The head of each such specified department or agency shall designate the officers and employees from his department or agency, in such numbers as the National Academy of Sciences shall determine, who shall be members of the Council, but shall designate only those persons who are acceptable to the Academy.

This order shall not be construed as terminating the tenure of any person who has heretofore been designated as a member of the Council.

LECTURE BY F. O. SCHMITT

"Some Aspects of the Chemical Structure of Living Matter" was the subject chosen by F. O. Schmitt, Institute Professor of Biology, Massachusetts Institute of Technology, for his lecture on February 7, which was presented in the current Academy–Research Council series. Dr. Schmitt recognized as a goal of research in his area an elucidation of the manner in which energy is coupled on the molecular lattices of the cell. Before this can be achieved, there must be a meticulous examination of structure, in this instance of certain fibrous proteins.

Collagen fibers, viewed at very high magnifications, appear regularly cross striated, demonstrating an axial periodicity which, in X-ray diffraction studies, is sufficiently uniform to develop some fifty orders of the main period. This is rather what one would expect, for, if essentially globular proteins are to be effectively utilized in fiber formation, they must of necessity be linked into strong chains. Electron microscopy shows us that the visible "banding" of the collagen fiber probably results from alternating regions of relative order and disorder in the amino acid side chains along the axis of the fiber. Thus the aggregation of component parts shows a strikingly precise and specific arrangement.

Most dramatic of the experimental evidence thus far available is the demonstration that, when an aqueous solution of collagen is subjected to one of several experimental environments, it will be regularly reconstituted into a physical form determined by that environment. This phenomenon is not only repeatable, it is re-

versible. Treated one way, collagen reforms as a striated fiber with one third the original repeating period; treated another, tactoidal forms lacking bands completely appear; treated still another way, the striations assume spacing which is for the first time symmetrical, the last resulting from an antiparallel arrangement of the individual component macromolecules. There is an impressive number of distinct, recognizable forms into which collagen may be reconstituted; the critical facts are those of specificity, repeatability, and reversibility. These observations, bolstered by preliminary examinations of structure-function relations in such other natural fibers as striated muscle and fibrin and supported by physical and chemical analyses, encourage us to believe that we have here a new and valuable insight into the basis of organic structure.

Ever careful to distinguish between fact and speculation, Dr. Schmitt did not deny himself or his audience some provocative remarks on the implications in studies of chromosomes and genes. It now seems entirely likely that the gene can be best explained as a structure depending upon *1*) the detailed fine structure of the component macromolecules; and 2) the physical and chemical environment of those molecules. Thus properties of a particular gene would be the sum of the interaction of adjacent molecules and its stability no greater or less than theirs. To demonstrate this may take some time. The immediate task is to show that the chromosome can be torn down and reconstituted in the manner just demonstrated for simpler proteins and that the chromosome bands bear a similar relation to its ultrastructure.

LECTURE BY SIR MACFARLANE BURNET

The structure of influenza virus was discussed in the seventh lecture of the current Academy–Research Council series, on February 21. The speaker was Sir Macfarlane Burnet, Director of the Walter and Eliza Hall Institute of Medical Research, Melbourne, Australia, Fellow of the Royal Society, and Foreign Associate of the National Academy of Sciences.

As the smallest structures with the essential characteristics of living organisms, viruses hold a key position in biological thought, quite apart from their medical importance. They offer the simplest focus for the joint application of biological and physicochemical disciplines, and hence the best hope of explaining life processes in physical and chemical terms. Many lines of evidence, derived from genetics, serology, cytology, organic and physical chemistry, and electron microscopy, contributed to the somewhat unconventional but coherent picture of the influenza virus presented here.

As described by Sir Macfarlane, the influenza virus is a spherical particle of varying size, averaging about 100 m μ in diameter, and sometimes bearing a smaller cylindrical filament of varying length. In contrast to the rigid structures of many other viruses, it is rather loosely organized. A single spherical particle may contain anywhere from 5 to 50 complete genetic complexes of ribonucleic acid and protein, analogous to chromosomes, along with varying amounts of adventitious cytoplasm from the host cell in which it was formed. Its surface membrane consists of a genetically determined mosaic of viral macromolecules, presumably somatic proteins, embedded in a matrix of lipid and mucoprotein derived from the cell surface. The filament, when present, is of similar structure but closer in composition to the cell membrane. Thus virus from a given host contains both virus-specific and host-specific elements. Only the spherical particle is infective, though the filament shares in lesser degree the antigenic and hemaglutinative properties of the surface membrane.

This structure is consistent with current concepts of the reproductive process, as outlined by Sir Macfarlane. Viral elements in the surface membrane attach the virus, by an enzyme-like action, to prosthetic groupings of mucoprotein on the surface of the host cell. The contents of the spherical virus particle penetrate the cell and enter into a replicating pool in which new viral material is synthesized from cellular constituents. Individual virus particles lose their identity at this stage; the material is noninfectious, and genetic characters are inter-

changed when more than one strain is present. In about three hours, new aggregates of viral material appear at the cell surface. Under their influence buds of virus membrane are formed from cell membrane and somatic viral elements, enclosing the viral aggregates together with varying amounts of cell cytoplasm. When closure is complete, these buds break free to form spherical virus particles. In some circumstances the membrane continues to grow for a time as a tubular stalk, giving rise to filamentous forms.

INTERNATIONAL CONGRESS OF PURE AND APPLIED CHEMISTRY

The XVth International Congress of Pure and Applied Chemistry (Analytical Chemistry) will be held in Lisbon, Portugal, September 9–16, under the sponsorship of the International Union of Pure and Applied Chemistry. According to the provisional program the scientific sessions will include five general lectures, ten sub-section lectures, and individual papers limited to 10–20 minutes. The ten sub-sections of the Congress are as follows: *1*) microchemical methods; 2) biological methods; 3) electrical methods; *4*) optical methods; 5) radio chemical methods; *6*) organic complexes; 7) results and statistical interpretations; 8) methods of adsorption and distribution; 9) generalities; *10*) standardization of methods and different applications. Excursions are being planned for the Congress participants, including possibly a 4-day voyage to the Island of Madeira. Aside from a series of social events, the organizing committee is planning visits to various factories in the environs of Lisbon.

The President of the Academy–Research Council has appointed the following representatives to the Congress:

S. E. Q. Ashley, General Electric Company
Roger G. Bates, National Bureau of Standards
W. D. Cooke, Cornell University
G. M. Kline, National Bureau of Standards
I. M. Kolthoff, University of Minnesota
Walter J. Murphy, American Chemical Society
F. D. Tuemmler, Shell Development Company
John Turkevich, Princeton University
Grant T. Wernimont, Eastman Kodak Company
Philip W. West, Louisiana State University
John H. Yoe, University of Virginia

LECTURE BY DAVID R. GODDARD

The eighth lecture in the 1955–56 Academy–Research Council series was delivered by David R. Goddard of the Botanical Laboratory, University of Pennsylvania, on March 13. His subject was "The Cell as a Metabolic Unit."

Dr. Goddard began by sketching the development of cytology from the original description of cells by Robert Hooke in 1665. After an initial period of descriptive studies by the early microscopists, interest lapsed until the eve of the 19th century, when attention began to focus on the cell as a living unit. During that century the cellular basis of physiology and pathology became firmly established; but until recent years, physiologists tended to concentrate on the roles of specialized cells as participants in bodily processes, rather than as objects of study in their own right. Recently advances in cytochemistry have reawakened interest in cellular physiology.

The central thesis of Dr. Goddard's remarks was that data of many kinds are far more meaningful when interpreted in terms of the cells involved than when related to grosser parameters such as weight or volume of tissue. This was illustrated by a review of studies in the Botanical Laboratory, principally upon the growing corn root tip, in which highly precise measurements were made of the growth, division, and metabolic processes of the cells. Cells, as well as tissues, have well-regulated patterns of growth; they do not follow the S-curve usually shown in textbooks, but reach their maximum size and stop abruptly.

The various aspects of cell metabolism vary according to smooth curves correlated with the growth cycle. Data obtained from a variety of species indicated that oxygen uptake and nitrogen content per cell are remarkably uniform despite wide variations in cell weight. Once regarded as a mere "bagfull of enzymes," the cell is now recognized as a highly organized system that regulates its own growth and metabolism according to intrinsic controls that must be discovered and understood before the processes taking place in larger systems can be correctly interpreted.

INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS

The Council, Executive Committee, and Finance Committee of the International Union of Geodesy and Geophysics (IUGG) met in Paris, April 17–21, at the Institut d'Astrophysique. These administrative bodies of the Union discussed many problems of vital importance to the work of the Union and reached a number of conclusions, which will be circulated to member nations for opinions and considered resolutions to be presented for official action at the XIth General Assembly to be held in Toronto in 1957. The National Academy of Sciences–National Research Council, the United States adhering body to the IUGG, was represented at the Paris meetings by J. W. Joyce of the National Science Foundation.

Among questions considered early in the sessions was that of selecting a location and date for the XIIth General Assembly of the Union. It was reported that invitations had been received from Argentina, Finland, West Germany, and India. Various proposals were made for the dates of the XIIth and future General Assemblies, and recognition was given to the importance of holding future meetings in areas removed from Western Europe.

A careful study of the formation of a Federation for the Permanent Services, already agreed to by URSI, IAU, ICSU, and Unesco, and a review of its proposed by-laws and statutes, resulted in the Council's endorsement of the proposed Federation. This action will be referred to the Toronto Assembly for confirmation.

A further proposal on which the Council will recommend approval by the next General Assembly is the proposed reorganization of the International Association of Volcanology, with a change in the Association's name to the International Association of Volcanology, Composition of the Earth, and Geochronology.

Other problems discussed related to the structure of the Union, including the need for easing the duties of the General Secretary and for expanding the Bureau to provide guidance on broad policy planning for the Union. The over-load in the duties of the General Secretary brought about by the increasing activities of the Union may be alleviated by greater cooperation of Association Bureaus and national committees, an increase in the monetary support of the Office, and the transfer of some of the present functions of the General Secretary's Office to the Federation of Permanent Services when it comes into being. The expansion of the Bureau to include the President, two Vice-Presidents, the General Secretary, the last Past President, the Chairman of the Finance Committee, and four Members-at-Large was agreed to on an ad hoc basis, any permanent change in the membership of the Bureau to require a modification of the statutes and by-laws by the General Assembly.

In preparation for the fullest possible collaboration in the technical planning and in the use of the data collected during the IGY, a series of subcommittees for the various disciplines was established to act as advisory groups to the Reporters of the Special Committee for the International Geophysical Year (GSAGI). These groups should provide more effective and active participation in IGY affairs than has the special IUGG Committee for the IGY, which has so far met only twice, once in Rome in 1954 and again in Brussels in 1955. It was recognized that only by current and continuing active participation in the IGY will the Union be prepared to assume its proper responsibilities when CSAGI is disbanded after the IGY ends.

At the conclusion of the five-day session of the Council, Executive Committee, and Finance Committee, the participants felt that this first meeting held between General Assemblies had been a profitable meeting in terms of long-range planning and discussion of administrative problems that face the Union and upon which it must take official action at the Toronto Assembly. The practice of convening the Council, the Executive Committee, and the Finance Committee at appropriate intervals between assemblies undoubtedly will continue.

The above informal report was provided by Dr. Joyce, who represented the United States at the meetings in Paris. An official report will be issued by the General Secretary of the Union.

ANNUAL MEETING DIVISION OF EARTH SCIENCES

The Division of Earth Sciences held its annual meeting on Saturday, April 28. Following the regular business meeting, some of the newest activities of the Division were reviewed:

1) T. F. Malone, Chairman of the Committee on Climatology, described the studies being made of the U. S. Weather Bureau's program in climatology. H. E. Landsberg, Chief of the Climatological Services Division of the Weather Bureau, expressed his appreciation for the help the Committee has rendered on problems of scientific personnel and data processing despite the fact that the initial study period has not yet been completed.

2) W. B. Heroy of the Committee on Waste Disposal reported that, pursuant to suggestions made at the Princeton conference, several lines of inquiry have been explored and found to hold promise for the ultimate disposal of radioactive wastes. The outlook for safe and economical disposal is more optimistic now than it was a year ago.

3) W. H. Bailey, Geography Branch of the Office of Naval Research, reviewed the origins and objectives of the program of support for field research in foreign areas and emphasized that the young geographers participating in the program have the opportunity to conduct investigations in areas and on topics of their own choosing. His summary of the first year's program highlighted the wide range of subjects and geographic scattering of the projects. The hope was expressed that more proposals would be received in 1956 from fields bordering geography, such as geomorphology, pedology, climatology, meteorology, agriculture, etc.

The afternoon session was devoted to a conference on nuclear geology which featured the informal presentation and discussion of new data and unresolved problems in age determination, lead isotope investigation, and terrestrial heat flow. Following the conference an ad hoc group met to explore the inter-relationship between the Division of Earth Sciences and the Subcommittee on Nuclear Geophysics of the Division of Physical Sciences.

SUMMER STUDY BY COMMITTEE ON UNDERSEA WARFARE

At the personal request of the Chief of Naval Operations and the Chief of Naval Research, the Committee on Undersea Warfare has organized a study group of eminent scientists who will review research needs bearing upon the future status of undersea warfare. The study will be conducted at Woods Hole, Mass., in close cooperation with the Woods Hole Oceanographic Institution and nearby universities.

The deliberations of the group will extend over the summer months and bring to Woods Hole approximately forty scientists representing such disciplines as oceanography, biology, physics, and engineering.

Leadership for the study is being supplied by C. O'D. Iselin and I. A. Getting of the Committee on Undersea Warfare.

INTERNATIONAL MATHEMATICAL UNION

During the past year (May 1, 1955–April 30, 1956) Ireland was admitted as a member of the International Mathematical Union (IMU). Other countries, including Poland and the USSR, may soon join the Union.

The IMU sponsored the following events in 1955–56: Symposia on Algebraic Topology, Oxford, England, June 29–July 1, 1955; on Algebraic Theory of Numbers, Tokyo, Japan, September 8–13, 1955; on Zeta Functions, Bombay, India, February 14–21, 1956; and a Conference on Mathematical Education in South Asia, Bombay, India, February 22–28, 1956. Detailed information regarding the scientific programs of the above meetings is given in the Annual Report of the Division of Mathematics for 1955–56.

The IMU Commission on the Exchange of Mathematicians has established an information service concerning mathematicians traveling in Europe. Individual mathematicians should communicate their travel plans to Professor W. Wunderlich, Technical University, Karlsplatz 13, Vienna, Austria.

Plans for a new medium for the publication of short monographs on topics of current interest, either a series like the *Ergebnisse*, or an annual volume of review articles, are being considered by the IMU Commission on Scientific Publications.

The U. S. National Committee of the International Mathematical Union, established several years ago by the Academy–Research Council to carry out effective United States participation in the IMU, has assisted the Union by providing a list of United States mathematicians for inclusion in a world directory of mathematicians now in preparation. The Commission on the World Directory of the IMU has so far received complete lists from 50 countries.

INVESTIGATION OF CANCER NOSTRUMS

Recently the American Medical Association (AMA) forwarded to state medical societies a resolution adopted last December, urging the establishment of State or regional cancer commissions to watch for the appearance of unsubstantiated claims for detection and treatment methods and to deal with them at the local level before they have achieved notoriety and emotional support. This resolution was proposed by the Committee on Cancer Diagnosis and Therapy which for nearly five years has been studying the problem of unorthodox proposals at the request of the AMA, the American Cancer Society, and the National Cancer Institute (*see* NEWS REPORT, Vol. 3, p. 73, 1953).

During its exploration of the problem the Committee has on several occasions attempted to initiate independent clinical trials of purported tests and remedies that had attracted widespread attention. Difficulties in securing the agreement of the proponent to a controlled evaluation, in obtaining supplies of the agent to be tested, and in enlisting the cooperation of reputable investigators have usually proved insuperable, and the Committee has been able to arrange for tests of only two substances, both prepared by the same individual. Meanwhile the success of state groups such as those in California and Massachusetts in dealing with local problems has pointed up the advantages of early action at the point of origin, where information on the results of therapy by the proponent is more readily accessible. The Committee has concluded that this is the most effective means of handling the problem.

The Committee has drawn on its experience to formulate criteria and procedures which will be available for the guidance of future investigations, and stands ready to consult with the medical societies on the organization and operation of the new commissions. At the request of the sponsors the Committee will remain active in the collection and review of information and the evaluation of data and will serve as a court of reference in case of need.

ADVISORY BOARD ON EDUCATION

At the initiative of the Division of Physical Sciences, the Governing Board of the Academy–Research Council has appointed an Advisory Board on Education to serve the entire Academy–Research Council. In his letter of appointment to the members of the Board, the President of the Academy noted the need for "a single senior group, selected from various fields to advise broadly on the undertakings and opportunities in the field of education."

Each Division of the Academy–Research Council has nominated a single member of high competence so that the complete Board represents in outstanding measure the complete spectrum of Academy–Research Council interests.

Under the chairmanship of Maynard M. Boring of the General Electric Company representing the Division of Engineering and Industrial Research, members of the Board held their baptismal meeting on May 16 at which time matters of Board scope and responsibility were considered. Other members of the Board are:

STEWART S. CAIRNS, University of Illinois, for Division of Mathematics
GEORGE R. HARRISON, Massachusetts Institute of Technology, for Division of Physical Sciences
HOWARD M. PHILLIPS, Emory University, for Division of Biology and Agriculture
CHALMER J. ROY, Iowa State College, for Division of Earth Sciences
JOHN C. WARNER, Carnegie Institute of Technology, for Division of Chemistry and Chemical Technology
DAEL WOLFLE, American Association for the Advancement of Science, for Division of Anthropology and Psychology
W. BARRY WOOD, JR., Johns Hopkins University, for Division of Medical Sciences

The next meeting of the Board will be held on June 14 following which meetings

will be held at three- to four-month intervals.

Members and associates of the Academy–Research Council are urged to communicate their ideas and suggestions to the Board for their consideration. Until further notice these should be addressed to John S. Coleman, Executive Secretary of the Division of Physical Sciences, who is serving as Secretary pro tem to the Board.

CONFERENCE ON PROPOSED STANDARD FABRIC FOR MICROBIOLOGICAL TESTING

The soil burial test for measuring resistance of materials to microbiological deterioration has been used widely for many years. It is employed extensively in military and other government specifications, as well as in research and development projects by the Government, industry, universities, and private organizations. In spite of this universal use, the method still has many inherent variables which make it very difficult to compare the results obtained by different laboratories and even by the same laboratory.

In an effort to reduce the number of these variables and to provide a common ground for comparison of results, the Prevention of Deterioration Center arranged a conference of U. S. Department of Defense and other Government and industrial representatives at the National Academy of Sciences on March 21. The meeting was under the sponsorship of the Materials Branch of the Engineer Research and Development Laboratory, Ft. Belvoir, Va.

The Engineer Research and Development Laboratory proposed and the conference accepted for the standard fabric a 37-inch wide, 8-ounce-per-square-yard white cotton duck. This fabric has blue threads woven in the warp direction at 1-inch (50-thread) intervals to facilitate cutting and raveling samples.

Although no standard fungicide was adopted at this meeting, several were proposed for consideration. A Continuations Committee with P. J. Hannan of the Engineer Research and Development Laboratory as chairman was elected at the conference and will extend the study and make recommendations for the fungicide and other details of procedure to be followed.

Minutes of the conference may be obtained by request from the Prevention of Deterioration Center, Academy–Research Council, 2101 Constitution Avenue, Washington 25, D. C.

FOOD AND NUTRITION BOARD NEW COMMITTEES

Responding to requests from the Agricultural Board, the Food and Drug Administration, and the Rockefeller Foundation, the Food and Nutrition Board of the Division of Biology and Agriculture has set up three new committees, all of which may in various ways contribute to the protection or improvement of human health.

Committee on Fats in Human Nutrition and Health

The Agricultural Research Institute, concerned with the effect of declining consumption of fats and oils on the agricultural economy, had caused a Committee on Fats and Oils to be set up within the Agricultural Board. Now, to provide information and advice need by this committee, the Agricultural Board has requested the Food and Nutrition Board to organize a committee on Fats in Human Nuitrition and Health. This new committee will study particularly the evidence on dietary levels and kinds of fat that are likely to be beneficial or deleterious to human health. The following are members of this committee:

PAUL L. DAY, University of Arkansas, School of Medicine, *Chairman*
EDWARD H. AHRENS, JR., Hospital of the Rockefeller Institute for Medical Research
JOHN B. BROWN, Ohio State University Medical School
WENDELL H. GRIFFITH, University of California Medical School
W. STANLEY HARTROFT, Washington University School of Medicine
RALPH T. HOLMAN, University of Minnesota
EUGENE P. KENNEDY, Ben May Laboratory for Cancer Research, University of Chicago

Committee on Coal-Tar Colors

Following a recommendation made by the Citizens Advisory Committee on the Food and Drug Administration (FDA), the Commissioner of FDA requested the Academy–Research Council to appoint a

special, or *ad hoc,* committee to review the research program of FDA on the coal-tar colors (certified dyes). Personnel for the committee were recommended by the Food Protection Committee after consulation with the Division of Medical Sciences. Members of this committee are:

WILLIAM J. DARBY, Vanderbilt University School of Medicine, *Chairman*
CARL A. BAUMANN, University of Wisconsin
CHARLES E. DUNLAP, Tulane University School of Medicine
CHARLES J. KENSLER, Arthur D. Little, Inc.
WILBUR KRETLOW, William J. Stange Company
ROBERT S. LONG, American Cyanamid Company
HENRY F. SMYTH, JR., Mellon Institute of Industrial Research

Committee on Protein Malnutrition

A deficiency of good-quality protein results in a severe and widespread form of malnutrition, particularly in children, throughout the most densely populated and least developed areas of the world. Because of the limited availability of proteinaceous foods of animal origin, this form of malnutrition can be remedied only by the development of acceptable protein foods from plant sources that will supplement the present food supply on a scientific and practical basis. For such developmental research, the Rockefeller Foundation has granted funds up to $250,000 to be expended during a three-year period under the supervision of a new committee of the Food and Nutrition Board. The committee will allocate the funds to competent and adequately equipped scientists in various parts of the world to carry out research recommended by the Food and Nutrition Board. The research will involve biochemical, microbiological, and laboratory-animal studies of potential food products, to be followed by clinical tests with both healthy and malnourished individuals.

Three United Nations agencies, namely, the International Children's Emergency Fund, the Food and Agriculture Organization, and the World Health Organization, have expressed a deep interest in this project and have promised cooperation.

The following are members of the committee on Protein Malnutrition:

W. H. SEBRELL, JR., Research Corporation, New York City, *Chairman*
WILLIAM J. DARBY, Vanderbilt University School of Medicine
GRACE GOLDSMITH, Tulane University School of Medicine
PAUL GYÖRGY, University of Pennsylvania Hospital
C. G. KING, The Nutrition Foundation, Inc.

STAFF APPOINTMENTS

The Academy–Research Council has announced the appointment of **Professor Masanori Nakaidzumi** as Associate Director of the Atomic Bomb Casualty Commission. Dr. Nakaidzumi recently retired as professor of radiology at Tokyo University where he served for 41 years in the medical school. He is a member of the Board of Directors of the Atomic Energy Research Institute of Japan, Vice-President of the Japan Radioisotope Association, and a specialist member and councillor of the Japan Atomic Energy Commission.

FELLOWSHIP PROGRAMS

NATIONAL SCIENCE FOUNDATION FELLOWSHIPS

For the fifth year the Fellowship Office of the Academy–Research Council has assisted the National Science Foundation (NSF) by receiving and evaluating applications for graduate and postdoctoral fellowships. The awards were announced by the Foundation on March 15.

There were 2,894 applications for graduate fellowships. The eight Graduate Fellowship Evaluation Panels met on February 21–23, and the final NSF Graduate Evaluation Board met on February 24. Eight hundred and eighty-one applications were recommended to the Science Foundation and 775 fellowships were awarded. Of these, 194 awards were made in the life

sciences, 570 in the physical sciences (including engineering and mathematics), and 11 in the fields of convergence, a new category this year which includes those subjects in which the natural sciences (and mathematics) converge with the social sciences and in which a fundamental element of experimental, quantitative training, and methodology is both needed and employed.

There were 390 applications for postdoctoral fellowships. The preliminary screening was done by the Academy–Research Council Divisional Committees during January. Their reports were prepared for and presented to the NSF Postdoctoral Fellowship Evaluation Board which met on February 22. The Board recommended 94 applications and 80 postdoctoral fellowships were awarded. Of these, 29 were awarded in the life sciences, 48 in the physical sciences, and 3 in the fields of convergence.

FELLOWSHIPS IN THE NATURAL SCIENCES

Five postdoctoral fellowships in the natural sciences have been awarded for 1956–57. These fellowships are supported by the American Chemical Society and Merck and Company and are administered by the Academy–Research Council.

A new predoctoral fellowship, established by Leeds and Northrop Company and administered by the Academy–Research Council, will be awarded alternately in the fields of chemistry and physics to provide advance scientific education for young scientists. This fellowship has been awarded for the first time for the academic year 1956–57 in the field of physics.

The following list indicates the institution from which the recipient received his degree as well as the nature and location of his fellowship research:

American Chemical Society Postdoctoral Fellows

Albert J. Moscowitz (to receive Ph.D. in June 1956, Harvard University)
Investigations in optical activity—Harvard University, with W. E. Moffitt.

Jerome William Sidman (Ph.D., University of California, 1955)
Research in electronic and vibrational states of complex molecules—University of Cambridge, England, with H. C. Longuet-Higgins.

Merck Senior Postdoctoral Fellows

Ernest Milton Gifford, Jr. (Ph.D., University of California at Berkeley, 1949)
Structure, growth, and morphogenic potentials of plant meristems under normal and experimental conditions—Biological Laboratories, Harvard University, with Ralph H. Wetmore.

John Gordon Torrey (Ph.D., Harvard University, 1950)
Research on the differentiation *in vitro* of single isolated plant cells—Strangeways Research Laboratory, Cambridge, England, with Honor B. Fell.

David Walter Weiss (Ph.D., Rutgers University, 1952)
The isolation of antigens of tubercle bacilli responsible for their primary toxicity and immunogenic properties—Oxford University, England, with A. Q. Wells.

Leeds and Northrop Predoctoral Fellow

David Adler (to receive B.S. in June 1956, Rensselaer Polytechnic Institute)
Quantum mechanics and theoretical nuclear physics—Harvard University.

AWARD OF FELLOWSHIPS IN THE MEDICAL SCIENCES

The Medical Fellowship Board of the Division of Medical Sciences has administered postdoctoral fellowships in the medical sciences for the Rockefeller Foundation for thirty-four years. Six years ago the program of the Board was augmented by a grant from the National Tuberculosis Association.

At the annual meeting of the Board in February 1956, ten appointments were made for the academic year 1956–57. The following list indicates the institution from which the recipients received the doctorate, as well as the nature and location of their fellowship research:

Fellowships in the Medical Sciences Administered for the Rockefeller Foundation

Elmer B. Brown, Jr. (M.D., Washington University Medical School, 1950)
Iron-overload and iron absorption—Washington University, with Carl V. Moore.

George F. Cahill, Jr. (M.D., College of Physicians and Surgeons, Columbia University, 1953)
Hormonal effects on carbohydrate metabolism *in vitro*—Harvard Medical School, with A. Baird Hastings.

George E. Connell (Ph.D., University of Toronto, Canada, 1955)
The relationship of nucleic acids to protein synthesis or amino acid exchange reactions—New York University College of Medicine, with Severo Ochoa.

Paul Horowicz (Ph.D., Johns Hopkins University, 1955)
Chemically induced contractures in single striated muscle fibers of the frog—Cambridge University, Cambridge, England, with A. L. Hodgkin.

Oleg Jardetzky (M.D., 1954; Ph.D., Candidate, 1956, University of Minnesota)
The type of bond formed by magnesium, manganese, and cobalt ions with biological polymers, in relation to catalytic activity—California Institute of Technology, with Linus Pauling.

Neil B. Madsen (Ph.D., Washington University, 1955)
Problems of intermediary metabolism—Oxford University, Oxford, England, with H. A. Krebs.

Jack Orbach (Ph.D., Princeton University, 1954)
A comparison of the effects of cerebral lesions in man and monkey—New York University-Bellevue Medical Center, with Hans-Lukas Teuber.

Franklin W. Stahl (Ph.D., University of Rochester, 1956)
Genetic aspects of the host-parasite relationship in lysogenic bacteria—California Institute of Technology, with G. Bertani.

Steven L. Wissig (Ph.D., Candidate, Yale University, 1956)
An electron microscopic investigation of the fine structure of muscle capillaries in various experimentally induced permeability states—Rockefeller Institute for Medical Research, with George E. Palade.

Fellowship in Tuberculosis Administered for the National Tuberculosis Association

Donald N. Medearis, Jr. (M.D., Harvard Medical School, 1953)
Aseptic meningitis in infancy and childhood—Children's Medical Center, Boston, Mass., with John F. Enders.

RESEARCH ASSOCIATESHIPS IN MATHEMATICS

The Office of Naval Research (ONR) has announced the award of six postdoctoral research associateships in mathematics for 1956–57. These awards were made upon the recommendation of the Committee on Mathematics Advisory to ONR. The recipients of the research associateships are given below, together with the specific field and location of their research:

Anatole Beck (Ph.D., Yale University, 1956)
Topological algebra—Tulane University, with B. J. Pettis

James M. G. Fell (Ph.D., University of California, 1951)
Investigations in C*-algebras, Washington University, with E. Hewitt

Klaus Krickeberg (Ph.D., University of Berlin, 1952)
Theory of measure, area, and generalized surfaces—University of Wisconsin, with L. C. Young

George R. Livesay (Ph.D., University of Illinois, 1952)
Topology, fixed point theorems—Cornell University, with Paul Olum

Zdzislaw A. Melzak (Ph.D., Massachusetts Institute of Technology, 1956)
Fractional steration of functions of one variable—University of Michigan, with T. H. Hildebrant.

Jean-Pierre G. Meyer (Ph.D., Cornell University, 1954)
Algebraic topology—Brown University, with W. S. Massey

AWARDS IN RADIOLOGICAL RESEARCH

The James Picker Foundation for several years past has made available a limited number of Fellowships and Grants for Scholars in Radiological Research. The Committee on Radiology of the Division of Medical Sciences serves as the administrative and scientific advisory body to the Foundation. Upon recommendation of the Committee, the Board of Directors of the Picker Foundation has approved three Fellowships and one Scholar Grant for 1956–57. The names of the appointees, the institutions from which they received the doctorate, and the nature and location of their research are as follows:

Fellowships

Leonard Davis (M.D., New York University School of Medicine, 1950)
The uses of a double balloon modified Miller-Abbott tube—Grace-New Haven Community Hospital, New Haven, Conn., with Robert M. Lowman.

Hans Ludin (M.D., University of Zurich, Switzerland, 1954)
Development and evaluation of pancreas pneumography—Cornell University Medical College, with John A. Evans.

Vincenzo Valentino (M.D., University of Naples, Italy, 1946)
The anatomical, angiographic and encephalographic aspects of cranioencephalic malformations producing clinical and pseudo-tumoral changes—Montreal Neurological Institute, McGill University, Montreal, Canada, with Donald McRae.

Grant for Scholar

William J. Tuddenham (M.D., University of Pennsylvania School of Medicine, 1950)
An investigation of the physiologic optics of roentgen interpretation—University of Pennsylvania School of Medicine.

RECORD OF MEETINGS

March	
1	FHA Study Committee on Wood Block Flooring
	Subcommittee on Guardrails and Guideposts, *Boston*
	Building Research Institute, Metal Curtain Wall Workshop Conference
	Ad hoc Subcommittee on Dietary Carcinogenesis, *Bethesda, Md.*
	Subcommittee on Food Technology and Subcommittee on Toxicology, Joint Meeting
	Synthetic Mica Panel, *Cambridge, Mass.*
2	Building Research Institute, Washington Representatives
	Committee on Cancer Diagnosis and Therapy
3	Committee on Food Protection and Industry Committee
	Merck Senior Postdoctoral Fellowship Board, *New York City*
5	Sub-panel on Alloys for Use at 1200°–1700° F., *New York City*
5–6	Agricultural Board
6	Committee on Toxicology
	Nuclear Data Group
7	Committee on Control of Deterioration
7–8	Committee on Agricultural Pests
8	Committee on Flame and Thermal Protective Combat Clothing, *Natick, Mass.*
	Federal Construction Council, Task Group on Flexible Floor Coverings
9	Ad hoc Conference on Insect Resistance to Insecticides
9–10	Biology Council, Subcommittee on Adult Education, *New York City*
9–11	Committee on Growth, Section on Fellowships
10	National Research Council Postdoctoral Fellowship Board in the Natural Sciences
	Subcommittee on Vector Control
12	Committee on the Education of Animal Technicians
	Committee on Growth, Executive Committee
13	Institute of Animal Resources, Governing Board
	Committee on Atomic Casualties
	Committee on Sanitary Engineering and Environment
	Panel on Ship Protection
	Building Research Institute, Program Committee for Masonry Construction Conference

March	
14–15	National Advisory Committee on AASHO Road Test
16	Committee on Ship Steel, Project Advisory Committee SR–139
16–17	Biology Council
19	Agricultural Research Institute, Information Committee, *Peoria, Ill.*
19–20	FHA Study Committee on Concrete Face Brick
20	Nuclear Data Group
	Federal Construction Council, Task Group on Electrical Loads for Buildings
21	Conference on Adoption of Proposed Standard Fabric for Microbiological Testing
	Highway Research Board, Subcommittee on Urban Research
	Subcommittee on Animal Products, *Chicago*
21–22	FHA Study Committee on Hot Water Heaters
22	Building Research Advisory Board, Review Committee for FHA Study Reports
	USA National Committee, International Union of Biological Sciences
23	Subcommittee on the Cardiovascular System
24	Ad hoc Panel on the Establishment of a Hemoglobin Standard
26	Subcommittee on Stress
	Division of Engineering and Industrial Research, Executive Committee
	Panel on Prevention of Deterioration
27–29	Synthetic Mica Panel, *Schenectady, N. Y.*
28	Committee on Science in Unesco
28–April 3	International Union of Pure and Applied Physics, International Commission on Optics, *Boston*
29	Food and Nutrition Board, Executive Committee
	Committee on Amino Acids
30–31	Food and Nutrition Board
	Committee on Geography, Advisory to ONR, *New York City*
April	
2	Special Committee to Review Pilot Plant Operation of Freeport Sulphur Co., *New Orleans*
	Subcommittee on Oncology
	Committee on High-Speed Calculating Machines, *Princeton, N. J.*
3	Nuclear Data Group
	Advisory Committee on Meteorology

April	
3–4	Conference on Evaluation of Pharmacotherapy in Mental Illness, Ad hoc Meeting of Clinical Committees
	Mine Advisory Committee, *San Diego*
	FHA Study Committee on Termites
3–5	Symposium on Aerial Delivery, *Fort Lee, Va.*
4	USA National Committee, IGY, Executive Committee
5	Subcommittee on Instruments and Techniques, *Oak Ridge, Tenn.*
5	Mine Advisory Committee, Conference on Mine Hunting Sonar, *San Diego*
5–6	FHA Study Committee on Vapor Barriers
6	Titanium Fabrication Panel
7	Division of Anthropology and Psychology, Annual Meeting
9	Committee for Research in Problems of Sex
	Committee on Handbook of Biological Data
	Committee on Revision of Mathematical Tables, *New York City*
9–12	Committee on Growth, Section on Fellowships, *Harriman, N. Y.*
10	Committee on Fire Research
	USA National Committee, IGY, Arctic Committee
11	Subcommittee on Wood Block Flooring
12	Committee on Fabrics for Body Armor, *Natick, Mass.*
	Subcommittee on the American Registry of Pathology
13	Committee on Pathology
	Panel on Sterilization of Blood and Plasma
	Ad hoc Panel on Burn Ointment, *White Sulphur Springs, W. Va.*
14	Ad hoc Panel on Pathology of Fatal Burns
	Committee on Fats, *Atlantic City*
15	Committee on Growth, Executive Committee, *Atlantic City*
16	Subcommittee on Water Supply, *Fort Belvoir, Va.*
	Subcommittee on Laboratory Animals, *Atlantic City*
	Committee on a National Atlas
	Committee on Ship Steel, Project Advisory Committee SR–139
17	Nuclear Data Group
	Subcommittee on Amino Acids, *Atlantic City*
18	Committee on Biological Chemistry, *Atlantic City*

April	
18	Committee on Protein Malnutrition, *Atlantic City*
	Panel on Textiles
19	Federal Construction Council, Operating Committee
	Panel on Titanium, *Columbus, Ohio*
20	Subcommittee on Personnel and Training
	Subcommittee on Radiation Sterilization, *Chicago*
	USA National Committee, IGY, Technical Panel on the Earth Satellite Program
	Conference on Electrical Insulation, Executive Committee
21	Committee on Applications of Mathematics, *New York City*
	Division of Chemistry and Chemical Technology, Annual Meeting
22	Postdoctoral Fellowship Board on Physiological Psychology
	National Academy of Sciences–National Research Council, Governing Board
	American Geological Institute, Executive Committee, *Chicago*
23	Committee on Patent Policy
23–24	Symposium on Protection and Functioning of the Hand in Cold Climates, *Natick, Mass.*
23–25	National Academy of Sciences, Annual Meeting
25	USA National Committee, IGY, Antarctic Committee
	American Geological Institute, Board of Directors, *Chicago*
26	Panel on Blood Coagulation
	Conference Board Committee on International Exchange of Persons
26–27	American Geophysical Union
27	Ad hoc Panel on Transfusion Problems
	Division of Earth Sciences, Executive Committee
	Panel on Ceramics and Adhesives
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28	Subcommittee on Blood and Related Problems
	USA National Committee, International Union of Pure and Applied Physics
	Division of Earth Sciences, Annual Meeting
29	Subcommittee on Radiochemistry
30	USA National Committee, International Scientific Radio Union

NEW PUBLICATIONS

Ash, J. E., and Raum, Muriel. *An Atlas of Otolaryngic Pathology.* Washington, Published under the joint sponsorship of The American Academy of Ophthalmology and Otolaryngology, The American Registry of Pathology, The Armed Forces Institute of Pathology, 1956. 572 p., illus. $20.00. (Available from: American Registry of Pathology, Armed Forces Institute of Pathology, Washington 25, D.C.)

Conference on Electrical Insulation. *Annual Report, 1955.* Washington, 1956 (National Academy of Sciences–National Research Council. Publication 396.) 59 p. $3.00.

Killian, Lewis M. *A Study of Response to the Houston, Texas, Fireworks Explosion.* Washington, 1956. (National Academy of Sciences–National Research Council. Publication 391. Committee on Disaster Studies, Disaster Study No. 2.) 25 p., illus. $0.75.

Landing, Benjamin, and Farber, Sidney. *Tumors of the Cardiovascular System.* Washington, Armed Forces Institute of Pathology, 1956. (*Atlas of Tumor Pathology.* Section III, Fasc. 7.) 138 p., illus. $1.50. (Available from: American Registry of Pathology, Armed Forces Institute of Pathology, Washington 25, D.C.)

Mayr, Ernst, and Goodwin, Richard. *Biological Materials. Part I, Preserved Materials and Museum Collections.* Washington, National Academy of Sciences–National Research Council, Biology Council, 1956. (National Academy of Sciences–National Research Council. Publication 399.) 20 p. $0.75.

National Research Council. Committee on Animal Health. Subcommittee on Bloat. *A Review of Bloat in Ruminants . . .* Washington, 1956. (National Academy of Sciences–National Research Council. Publication 388.) 64 p. $2.00.

National Research Council. Food Protection Committee. *The Use of Chemical Additives in Food Processing.* Washington, 1956. (National Academy of Sciences–National Research Council. Publication 398.) 91 p. $2.00.

National Research Council. Highway Research Board. *Design and Testing of Flexible Pavement . . .* Washington, 1955. (National Academy of Sciences–National Research Council. Publication 401. Highway Research Board Bulletin 114.) 87 p., illus. $1.65.

National Research Council. Highway Research Board. *Effects of Chlorination and Microorganisms and Constituents of Asphalts . . .* Washington, 1956. (National Academy of Sciences–National Research Council. Publication 405. Highway Research Board Bulletin 188.) 48 p., illus. $0.90.

National Research Council. Highway Research Board. *Experimental Concrete Pavements.* Washington, 1956. (National Academy of Sciences–National Research Council. Publication 403. Highway Research Board Bulletin 116.) 71 p., illus. $1.35.

National Research Council. Highway Research Board. *Factors Influencing Travel Patterns . . .* Washington, 1956. (National Academy of Sciences–National Research Council. Publication 406. Highway Research Board Bulletin 119.) 94 p. $1.80.

National Research Council. Highway Research Board. *Land Acquisition, 1955 . . .* Washington, 1956. (National Academy of Sciences–National Research Council. Publication 366. Highway Research Board Bulletin 113.) 83 p. $1.80.

National Research Council. Highway Research Board. *Statistical Analysis of Highway Accidents . . .* Washington, 1956. (National Academy of Sciences–National Research Council. Publication 404. Highway Research Board Bulletin 117.) 31 p. $0.75.

National Research Council. Highway Research Board. *Vertical Sand Drains for Stabilization of Embankments . . .* Washington, 1955. (National Academy of Sciences–National Research Council. Publication 402. Highway Research Board Bulletin 115.) 52 p., illus. $0.90.

Niering, William A. *Bioecology of Kapingamarangi Atoll, Caroline Islands: Terrestrial Aspects.* Washington, National Academy of Sciences–Research Council, Pacific Science Board, 1956. (Scientific Investigations in Micronesia. SIM Report No. 22.) 32 p., maps. (Not available for general distribution.)

Stevens, Russell B. *Career Opportunities in Biology.* Evanston, Ill., Row, Peterson and Company, 1956. 64 p. $0.48.

United States National Committee for the International Geophysical Year. *Antarctic Program, April 1956.* Washington, National Academy of Sciences–National Research Council, 1956. 53 p.

Vacuum Requirements for Canned Tomatoes. A Symposium Sponsored by the Quartermaster Food and Container Institute . . . February 18, 1955. Washington, National Academy of Sciences–National Research Council, Advisory Board on Quartermaster Research and Development, Committee on Foods, 1956. 64 p., illus. (Available from: Quartermaster Food and Container Institute for the Armed Forces, 1819 W. Pershing Road, Chicago 9, Ill.)

Wallace, Anthony F. C. *A Study of the Literature and Suggestions for Further Research, Human Behavior in Extreme Situations.* Washington, 1956. (National Academy of Sciences–National Research Council. Publication 390. Committee on Disaster Studies, Disaster Study No. 1.) 35 p. $0.75.

Wallace, Anthony F. C. *An Exploratory Study of Individual and Community Behavior in an Extreme Situation, Tornado in Worcester.* Washington, 1956. (National Academy of Sciences–National Council. Publication 392. Committee on Disaster Studies, Disaster Study No. 3.) 166 p., illus. $2.50.

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